REMARKS/ARGUMENTS

Claims 1-21 are pending. New claims 20-21 have been added. No new matter has been introduced. Applicants believe the claims comply with 35 U.S.C. §112.

Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Malakapalli et al. (U.S. Patent No. 6,467,060) in view of Fredrickson et al. (U.S. Patent No. 5,805,799).

Applicant respectfully submits that independent claims 1, 8, and 15 are novel and patentable over Malakapalli et al. in view of Fredrickson et al. because, for instance, Malakapalli et al. does not teach or suggest the reassigning of data from an old logical block address (LBA) to a new LBA when a portion of the data storage medium associated with the old LBA contains a defect.

The present invention relates to storage systems, and more particularly to techniques for updating cyclic redundancy check (CRC) bytes used to correct errors in data bytes within a data storage system. Specifically, data is typically written to a sector associated with a logical block address (LBA) that identifies the location of the sector on the disk. CRC error correction code (ECC) check bytes can then be calculated. However, if a defect is present within the sector to be written to, the data must be reassigned to a different LBA on the disk that does not contain a defect. Correspondingly, new CRC bytes must be calculated. Instead of recalculating the CRC bytes using the new LBA, only a portion of the CRC check bytes are updated, as shown below in reference to Figure 2:

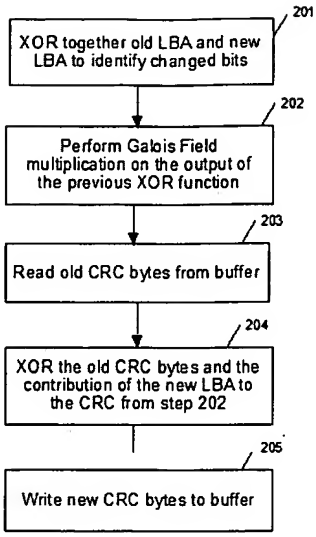

FIG. 2

In contrast, *Malakapalli et al. fails to teach or suggest the reassigning of data from an old logical block address (LBA) to a new LBA when a portion of the data storage medium associated with the old LBA contains a defect.* In Figures 8 and 9, Malakapalli et al. describes the writing and reading of data from a disc using a master CRC to verify data integrity. For example, in column 13, lines 9-22, Malakapalli et al. discusses a response to an error in the sector to be written to or a CRC associated with the sector:

> If the recalculated master CRC 990 is not equal to the master CRC 960 that is associated with the 512-byte sector 980, indicating an error in either the 512-byte sector 980 or the associated CRC 960, then the ECC 965 is used to attempt correction of the error, after which the master CRC 990 is recalculated again and compared again to the retrieved master CRC 960, and if the second comparison does not indicate equality, *the 512-byte sector of data 980, the associated master CRC 960, and the ECC 965 is discarded and retrieved again from the disc 840.* (Emphasis added)

Instead of reassigning the data to be written to a new LBA address in response to the defect or error in the sector to be written to, the entire sector of data is discarded and retrieved again from the disc, along with the original master CRC data. While Malakapalli et al. does describe a response to an error on a disk, it does not teach or suggest reassigning the data

from an old LBA address associated with the section of the disk that contains the error to a new LBA address.

Other references relied upon by the Examiner in combination with Malakapalli et al. do nothing to supply this absent teaching. For example, Fredrickson et al. is used to allegedly disclose a CRC engine that performs an exclusive OR (XOR) function on the new LBA and old LBA, performs Galois Field multiplication on a result of the first XOR function, and performs a second XOR function on a result of the Galois Field multiplication and the old cyclic redundancy check bytes to generate updated cyclic redundancy check bytes that are based on the new LBA.

Fredrickson et al. describes the use of a data integrity block (DIB) that "is provided to verify that the LBA value associated with a given data block in a host interface matches the value associated with that same data block in a buffer memory and in a data sequencer." (Abstract) For example, a DIB may be appended to data blocks to provide additional cross-check redundancy to protect against ECC miscorrection. However, Fredrickson et al. does nothing to teach or suggest the reassigning of data from an old logical block address (LBA) to a new LBA when a portion of the data storage medium associated with the old LBA contains a defect. As a result, Fredrickson et al. does not remedy the deficiencies of Malakapalli et al.

For at least the foregoing reasons, Applicant respectfully asserts that independent claims 1, 8, and 15 are novel and patentable over Malakapalli et al. and Fredrickson et al.

The dependent claims are submitted to be novel and patentable as being directed to additional features of the invention as well as by being dependent allowable independent claims 1, 8, and 15. For example, dependent claim 10 is patentable over Malakapalli et al. and Fredrickson et al. because, for instance, it further recites that performing the second exclusive OR function on the second result and the old cyclic redundancy check bytes further comprises performing an exclusive OR function on data bytes in the sector and zero bytes. This feature is completely absent in Malakapalli et al. and Fredrickson et al.

New dependent claims 20-21 depend on independent claims 1 and 15 and further recite, similar to dependent claim 10, that performing the second XOR function on a result of the Galois field multiplication and the old cyclic redundancy check bytes further comprises performing an exclusive OR function on data bytes in the sector and zero bytes. Support for claims 20-21 can be found, for instance, in paragraph 39 and Fig. 5.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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